Stratigraphy and Depositional Setting of the Pliocene Kanapoi Formation, Lower Kerio Valley, Kenya

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ABSTRACT. The Pliocene sedimentary sequence at Kanapoi is attributed to the Kanapoi Formation, newly defined here. The formation consists of three sedimentary intervals, a lower fluvial sequence, a lacustrine phase, and an upper fluvial sequence. The entire formation is strongly influenced by paleotopography developed on the underlying Mio–Pliocene basalts, with a landscape of rounded hills and up to 40 m in local relief. The lower fluvial interval is dominated by conglomerates, sandstones, and pedogenically modified mudstones. Two altered pumiceous tephra occur within this interval. A sharp contact marks the transition to fully lacustrine conditions. This interval is characterized by laminated claystones and siltstones, lenticular sand bodies, and abundant ostracods, mollusks, and carbonized plant remains. A single vitric tephra, the Kanapoi Tuff, occurs within this interval. A return to fluvial conditions is recorded first by upward fining cycles reflecting a meandering river system. This is succeeded by deeply incised conglomerates and sands of a braidplain, capped by the Kalokwanya Basalt. The Kanapoi Formation is richly fossiliferous, and has yielded the type specimen as well as much of the hypodigm of *Australopithecus anamensis*. Vertebrate fossils derive primarily from two depositional settings within the formation: vertic floodplain paleosols and deltaic sand bodies. These reflect successional stages in the development of a major tributary system in the Turkana Basin during the early Pliocene.

INTRODUCTION

The Pliocene sedimentary sequence at Kanapoi presents a complex record of fluvial and lacustrine strata deposited over a landscape of considerable local relief (up to 40 m) on Mio–Pliocene volcanics. Early fluvial systems accumulated predominantly overbank mudstones, with a well-developed soil overprint, associated with lenticular sands and gravels. A lacustrine phase, the Lonyumun Lake, in the middle of the sequence is marked by laminated claystones and molluskan bioherms, with thick deltaic sand bodies. Following local infilling of the lake, a fluvial regime is again represented. The top of the sedimentary interval is dominated by a thick and deeply incised conglomeratic unit that accumulated prior to capping of the entire sequence by the Kalokwanya Basalt.

Vertebrate fossils are found throughout the sedimentary sequence, being particularly abundant in the deltaic sand bodies, but are also found in paleosols of the lower and upper fluvial sequences. Fossil invertebrates are common in the lacustrine facies, though the quality of preservation tends to be poor. Lacustrine mudstones preserve abundant plant impressions and carbonized remains at several levels.

Isotopic age determinations on materials from Kanapoi by I. McDougall of the Australia National University (Leakey et al., 1995, 1998) established a precise chronostratigraphy for the sequence. The major phase of deposition is constrained to fall between 4.17 and 4.07 Ma, and the capping Kalokwanya Basalt is placed at 3.4 Ma. The Kanapoi deposits reflect an early stage of accumulation within the developing Plio–Pleistocene Turkana Basin.

The geological investigations reported here were conducted over eight visits to Kanapoi between 1992 and 1996. Field mapping and 21 stratigraphic sections are the basis for a formal definition of the Kanapoi Formation presented here. Analysis of depositional environments, postdepositional modification, and sedimentary architecture are the basis for a reconstruction of the environmental setting for the rich Kanapoi fossil assemblage.

BACKGROUND

The sedimentary strata around Kanapoi were first described by Patterson (1966). He recognized many of the important features of the local geology. The interval he described was predominantly lacustrine in character and comprises the middle unit in the sequence described here. No formal stratigraphic terminology or subdivision of the strata was proposed, although a section measuring 175 ft. (53.3 m) is mentioned. The first report of a hominid fossil from Kanapoi by Patterson and Howells (1967) included a few additional observations on the geology of the sequence.

Patterson et al. (1970) discussed the Kanapoi fauna, and used the term 'Kanapoi Formation' for the sequence, but provided no descriptions, sections, or type locality. The most detailed geological work conducted prior to the 1990s was Powers'

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(1980) investigation of strata of the Lower Kerio Valley. He provided sections and descriptions of the sedimentary strata at Kanapoi, as well as an interpretation of depositional environments and post-depositional modification. Most of the early discussion of Kanapoi centered around attempts to date the sequence, including isotopic age determinations on the overlying Kalokwanya Basalt, as well as biostratigraphic comparisons.

The systematic field work undertaken by the National Museums of Kenya in the early 1990s, under the direction of M. G. Leakey, led to important new fossil discoveries, a reinvestigation of the sedimentary sequence, and establishment of detailed chronostratigraphic control (Leakey et al., 1995, 1998). A detailed analysis of the numerous paleosols in the Kanapoi sequence was reported by Wynn (2000).

EXPOSURE AND STRUCTURE

The entire sedimentary sequence at Kanapoi dips very gently (~1°) to the west. Local depositional dips, however, can be quite high. These are commonly 12–15° at some distance above the basement, and may reach 45° where sediments are draped directly over hills in the volcanic basement. Several small faults (0.5–1.0 m offset) occur in the study area, and in the southeast, a more significant normal fault (bearing 310°, down to NE) offsets the section by several tens of meters. For the most part, however, the sequence is much more strongly affected by deposition over pre-existing topography than by subsequent tectonics.

THE KANAPOI FORMATION

The Pliocene sedimentary rocks exposed in the Kanapoi region (Fig. 1) are here defined as the Kanapoi Formation. The type section of the formation, section CSF 95-8 (Fig. 2), is located in the southeastern part of the exposures and displays most of the major characteristics of the formation. Where exposed, the base of the formation rests unconformably on Mio–Pliocene basalts. The Pliocene Kalokwanya Basalt unconformably caps the formation. In the type section, the Kanapoi Formation is 37.3 m thick. Some local sections are known to reach nearly 60 m in thickness, and the formation can be seen to pinch out entirely between the basalts to the east and north.

The new formation designation is justified on both lithostratigraphic and historical grounds. The formation is mappable and lithologically distinctive. Unifying characteristics include the dominance of paleotopographic influence in sedimentary accumulation pattern and an early basaltic clast dominance later replaced by silicic volcanics. The single tephrostratigraphic marker within the formation that has been geochemically characterized is the Kanapoi Tuff (Leakey et al., 1998). The formation is related to synchronic deposits of the Turkana basin farther north, but historical usage, complex relationships, and lack of correlative marker tephra (boundary stratotypes) preclude assignment to any previously defined stratigraphic units. The lower portion of the formation likely correlates with the upper Apak Member of the Nachukui Formation described from Lothagam (Feibel, 2003). The lacustrine interval in the middle of the Kanapoi Formation is correlative with the lower Lonyumun Member of the Nachukui and Koobi Fora Formations (Brown and Feibel, 1986; Harris et al., 1988). The upper sedimentary interval in the Kanapoi Formation corresponds broadly to lower members of the Omo Group formations to the north (Moiti and Lokochot Members of the Koobi Fora Formation or Kataboi Member of the Nachukui Formation).

Three tephra units within the Kanapoi Formation have been isotopically dated. Two devitrified pumiceous tephra low in the sequence yielded ages of 4.17 ± 0.03 Ma (lower pumiceous tuff) and 4.12 ± 0.02 Ma (upper pumiceous tuff) (Leakey et al., 1995), while the vitric Kanapoi Tuff was found to contain rare pumices, which were dated to 4.07 ± 0.02 Ma (Leakey et al., 1998). In addition, the overlying Kalokwanya Basalt has been dated to 3.4 Ma, providing an upper limit on the age of the formation. The onset of accumulation is estimated to have begun around 4.3 Ma. Most of the subconglomeratic sequence likely accumulated prior to 3.9 Ma, but the sedimentary environments responsible for accumulation of the uppermost Kanapoi strata were likely active up until extrusion of the Kalokwanya Basalt.

The Kanapoi sedimentary sequence was deposited on a dissected volcanic landscape with at least 40 m of local relief. This basal topography had a strong influence on the lateral variability of the sequence and disrupted the sedimentation pattern through nearly the entire stratigraphic thickness. The lowermost stratigraphic units are localized within paleotopographic lows, while the superposed strata become more and more laterally continuous upwards. The onlapping sequence of sediments is complex, as the strata were deposited more-or-less horizontally, against this topographic surface. The overall stratigraphic sequence of the Kanapoi Formation reflects three intervals, an initial fluvial regime, a subsequent lacustrine phase, and a final return to fluvial conditions.

Local basement for the Kanapoi Formation consists of Mio–Pliocene basalts. They are typically spheroidally weathered, and present a landscape of conical hills, many of which protrude through the eroding sedimentary sequence today (Fig. 1). There is considerable variation in the nature of the contact between the local basement and the Kanapoi Formation, primarily as a function of paleotopographic position. The most common association, seen in paleotopographic lows as well as at other positions, is a scoured relationship, which superposes basalt cobble- to pebble-conglomerates, or less frequently sandstones, on basalt basement (Fig. 2: sections CSF 95-8, 95-10). Slightly higher paleotopographic positions sometimes preserve a gravel

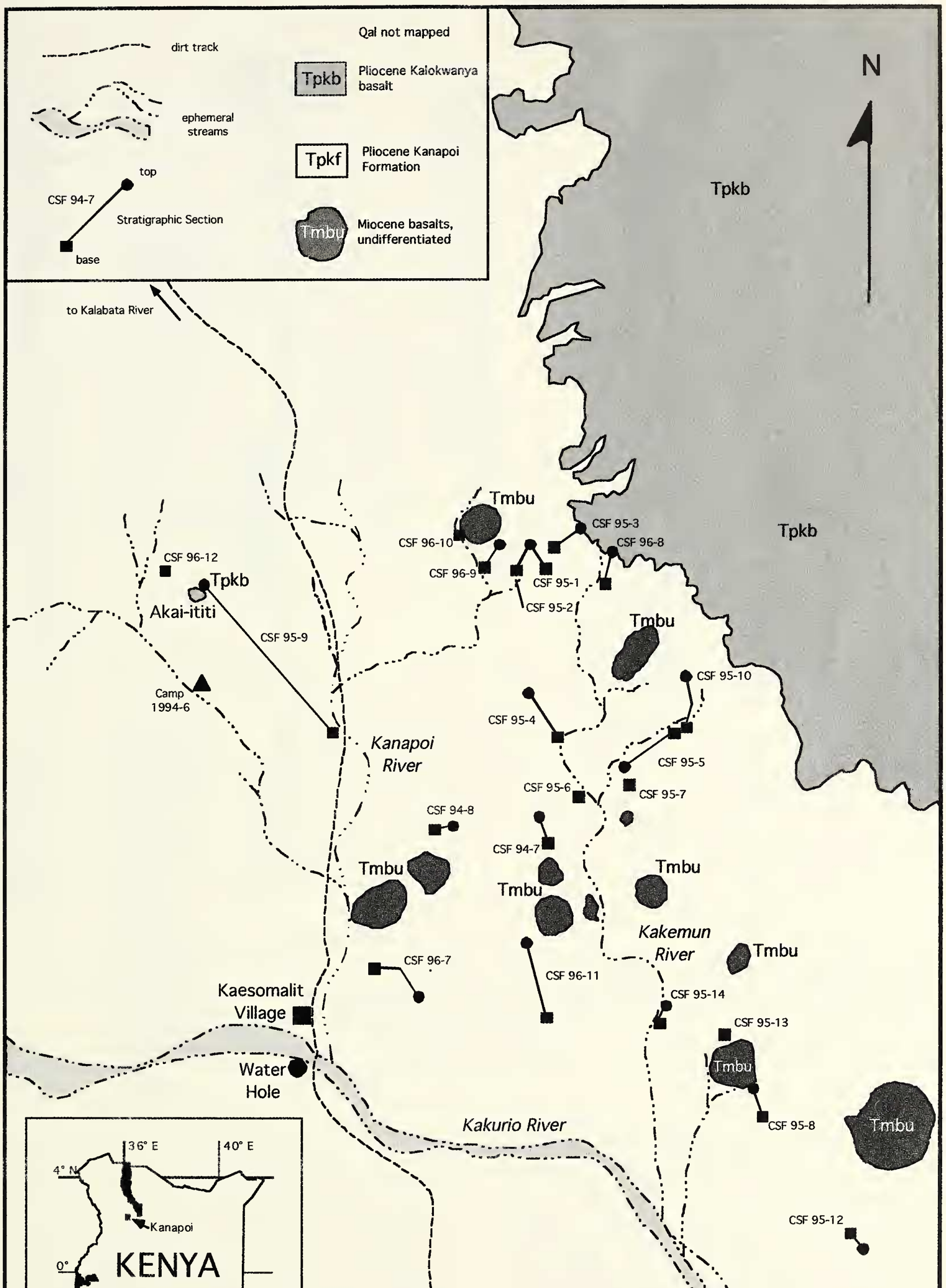

Figure 1 Geological map of the Kanapoi area showing prominent geographic landmarks and locations of the stratigraphic sections

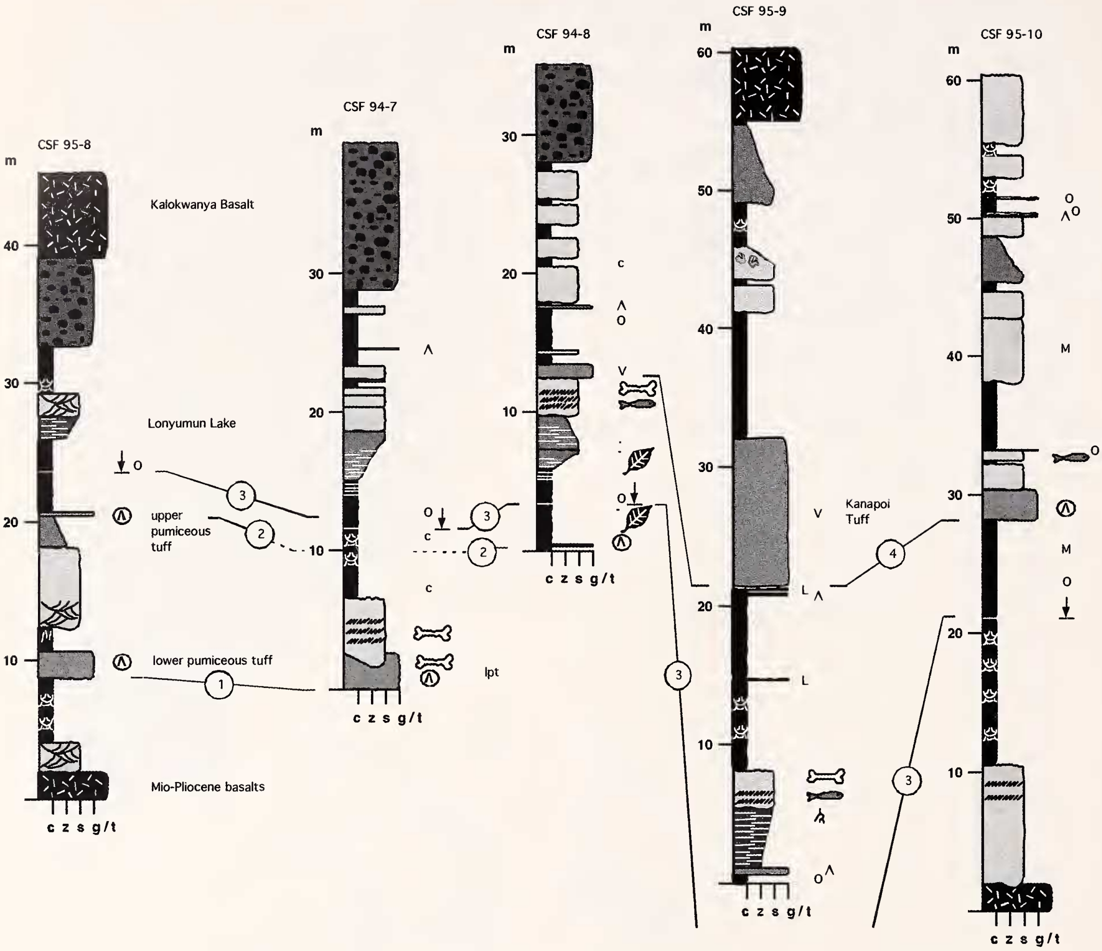

Figure 2 Type section (CSF 95-8) and reference sections of the Kanapoi Formation. Numbered correlations shown are 1, lower pumiceous tuff; 2, upper pumiceous tuff; 3, basal flooding surface of the Lonyumun Lake sequence; and 4, Kanapoi Tuff. See Figure 1 for location of sections. For a key to symbols, see Figure 3

regolith developed on the basalt, along with a blocky structured paleosol developed on silts or clays (Fig. 4; sections CSF 96-10, 95-13). At even higher paleotopographic positions, corresponding to the landscape exposed at the time of inundation by the Lonyumun Lake, molluskan packstones representing bioherms up to 1 m in thickness are developed on what were then islands of the basalt basement. The highest of the paleotopographic hills preserves a pebbly clay paleosol that has been contact baked upon extrusion of the capping Kalokwanya Basalt (east of CSF 96-8).

The initial sedimentary interval of the Kanapoi Formation, informally termed the lower fluvial sequence, can be constrained between the Mio–Pliocene basalts below and the lacustrine sequence above. The base of the lacustrine sequence is a sharp boundary in virtually all sections and is easily recognizable by an abundance of ostracods, carbonized plant fragments, and/or mollusks. The lower fluvial sequence is characterized by conglomerates, sandstones, and claystones with well-developed vertic (paleosol) structure. The conglomerates are generally massive, basalt cobble to pebble units. Sandstones are medium- to fine-grained, quartzofeldspathic or litharenitic, and commonly display well-developed planar crossbedding in 10–20 cm bedsets. Large-scale trough crossbedding is locally seen in coarser sandstones, while the finer grained sands and upper portions of sand bodies are typically massive due to bioturbation. Mudstones are generally quite thick in the lower fluvial sequence (up to 10 m; sections CSF 95-10 in Fig. 2 and 95-5 in Fig. 5), with well-developed paleosols. Wynn (2000) has provided a detailed analysis of paleosols throughout the formation. The most common paleosol is the Aberegaiya pedotype, a thick, often cumulative vertisol with well-developed wedge-shaped peds and slickensided dish fractures. This lower sedimentary sequence records a depositional regime controlled by fluvial systems, and

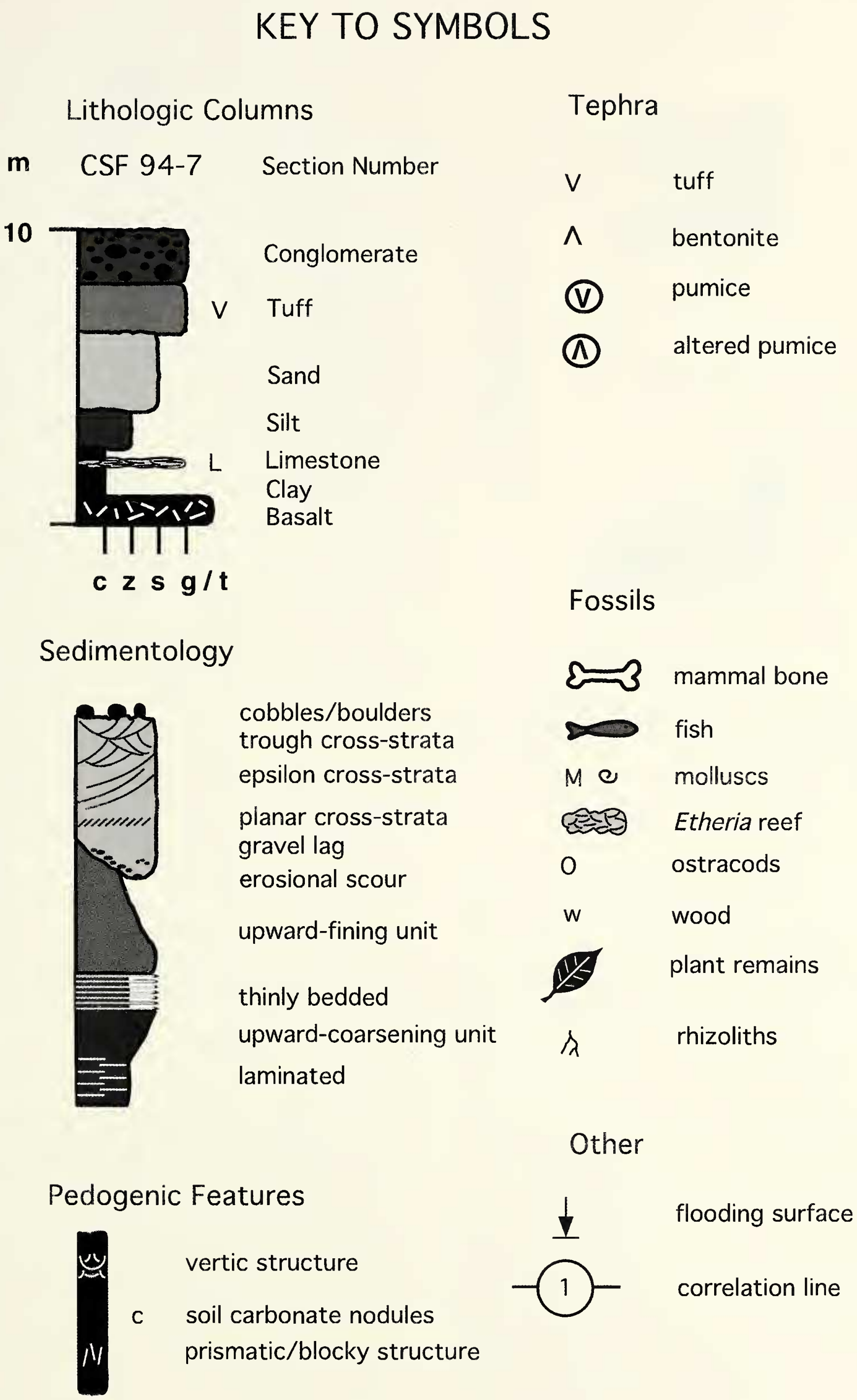

Figure 3 Key to symbols for the graphic sections presented in this report

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there are indications of both braided and meandering streams based on internal sequences and primary structures.

Several tephra units are intercalated within the lower fluvial sequence. The two most prominent of these display characteristics of airfall tephra that mantled the Kanapoi paleolandscape. The lower pumiceous tephra layer is a thick (up to 3.6 m), poorly sorted unit, with altered angular pumice clasts to 1 cm in diameter scattered throughout.

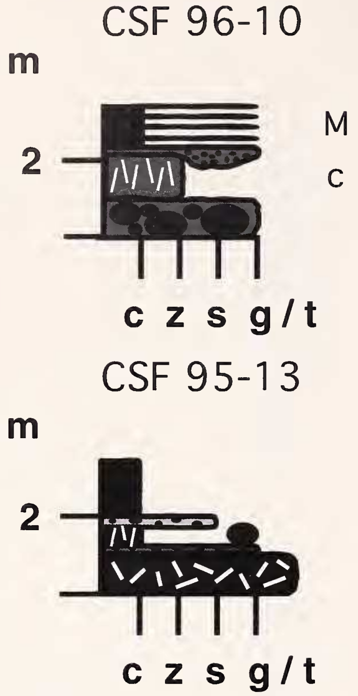

Figure 4 Reference sections from the basal contact of the Kanapoi Formation. See Figure 1 for location of sections. For a key to symbols, see Figure 3.

The upper pumiceous tephra layer is a thinner unit (ca. 15 cm), and displays laminated basal and upper subunits with an unsorted pumiceous middle. The vitric component of these tephra has been completely altered to clay and zeolite minerals. Both, however, had a significant pumiceous component. The pumices have been devitrified and slightly flattened, but appear as clay pebbles dispersed throughout the units. Devitrification of the pumices has left a residual population of volcanogenic feldspar crystals, which have been used to control for the age of the strata and associated fossils.

Overlying the lower fluvial sequence and locally banked against the higher elements of the eroded volcanic basement is a lacustrine interval. Lithostratigraphic, chronostratigraphic, and biofacies indicators all support correlation of this lacustrine interval with the Lonyumun Lake phase well known from the Omo Group deposits of the northern Turkana Basin (Brown and Feibel, 1991; Feibel et al., 1991) as well as from Lothagam (Feibel, 2003) and elsewhere in the lower Kerio Valley (Feibel, unpublished). Where the volcanic basement produced local islands in this lake, they are mantled by a molluskan packstone, dominated by the gastropod *Bellamya* Jousseaume, 1886. Elsewhere, the lacustrine strata begin with a mollusk- and ostracod-rich claystone, typically succeeded by a well-laminated claystone and siltstone sequence, and continue with an upward coarsening sequence, which is capped by distributary channel sands. The upper portion of the deltaic complex has isolated sand bodies, representing distributary channels. This deltaic complex contains the only vitric tuff preserved at Kanapoi. This unit, termed the Kanapoi Tuff (Leakey et al., 1998), is a pale brown, fine-grained tuff with well-preserved climbing-ripple cross-lamination. Upper portions of the tuff commonly show soft-sediment deformation, and in a few localities, the tuff preserves pumice. The composition of this tephra indicates an iron-rich rhyolite (Table 1). Although this tephra does not correlate with any of the well-known tephra of the Turkana Basin Omo Group sequence, Namwamba (1993) has suggested that it correlates with his Suteijun Tuff of the Chemeron Formation in the Baringo Basin to the south.

Above the Kanapoi Tuff, lacustrine conditions persisted locally for a short period. In an important locality west of Akai-ititi, a distributary channel sequence is cut into the Kanapoi Tuff (Fig. 6). Here the eroded channel base is draped with a molluskan packstone that includes a well-developed reef of the Nile oyster *Etheria* Lamarck, 1807. The remainder of the channel is filled with a quartzofeldspathic sand. The record of *Etheria* in a channel setting documents the perennial nature of the river at this time. The transition from the lacustrine interval to the upper fluvial interval is not sharp, as in the base of the lacustrine sequence, but rather proceeds through an interval of interbedded shallow lacustrine muds and those with a clear pedogenic overprint indicating exposure. There are also several moderate to well-developed paleosols within the lacustrine sequence, indicative of instability in lake-level as well as local emergence due to delta progradation. Wynn (2000) reports several new pedotypes from this stratigraphic interval due to these particular conditions.

In most sections, the overlying sedimentary sequence again becomes dominated by a fluvial system, and several coarse gravels with significant erosional bases cap the sedimentary deposits. This interval is referred to here as the upper fluvial sequence. Like the lower fluvial sequence, this interval exhibits a high degree of lateral variation (Fig. 7). The influence of the basement topography is considerably less, however, and thus the sequence presents more characteristic upward-fining units indicative of a meandering fluvial system. It is noteworthy that, in all but one section, once fully fluvial conditions are re-established, there is no further indication of lacustrine conditions or even of floodplain ponding. The single exception is seen in section CSF 95-10 (Fig. 2). Here a thin interval of ostracod-packed claystones and fissile green claystones clearly indicates deposition in a lake or pond. This interval rests on a thin bentonite. It is possible that this sequence represents the Lokochot Lake, a lacustrine phase, which occurred ca. 3.5 Ma in the Turkana Basin. The Lokochot Lake is well documented from Omo Group deposits in the northern Turkana Basin

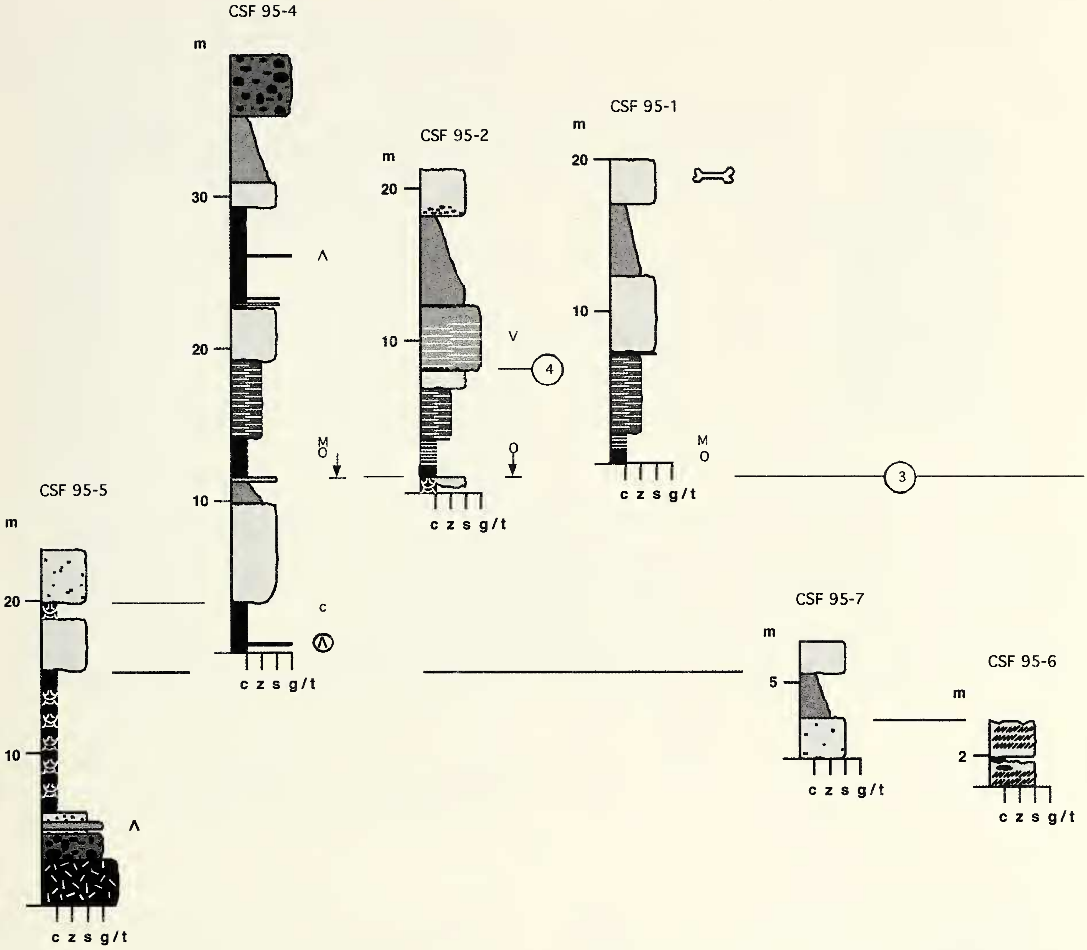

Figure 5 Reference sections from the lower and middle portions of the Kanapoi Formation. Numbered correlations shown are 3, basal flooding surface of the Lonyumun Lake sequence; and 4, Kanapoi Tuff. Unnumbered correlations are lithologic contacts walked out between sections. See Figure 1 for location of sections. For a key to symbols, see Figure 3

(Brown and Feibel, 1991; Feibel et al., 1991), and has been recognized elsewhere in the lower Kerio Valley (Feibel, unpublished).

The uppermost strata of the Kanapoi Formation are a sequence of massive cobble- to pebble-conglomerates, which incise deeply into the underlying fluvial strata. These conglomerates are dominated by silicic volcanics, with a matrix of litharenite sand. The conglomerates may occur as multiple units and may reach up to 21 m in thickness. They often have thin sand interbeds. Mudstones are rare in this upper part of the section, and by the top of the formation, the depositional setting appears to have developed into a gravel braidplain. These gravels are overlain by the Kalokwanya Basalt (Powers, 1980). The basalt has been dated to 3.4 Ma by McDougall (Leakey et al., 1995). In some localities, the basalt fills deep channels cut into the conglomerates.

The vertical and lateral variations in lithofacies

Table 1 Electron microprobe analysis of glass from the Kanapoi Tuff (Leakey et al. 1998).[a]

Sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O	MgO	MnO	TiO_2	Cl	F	Zr	Total	N
KP01-15-01	70.36	7.86	8.32	0.37	3.93	1.73	0.01	0.25	0.25	0.42	0.03	NA	93.53	6
K92-4846	69.50	7.55	8.31	0.28	0.26	0.16	0.01	0.25	0.23	0.52	0.01	0.29	96.49	13
K92-4847	69.76	7.66	8.42	0.29	0.37	0.24	0.01	0.25	0.24	0.48	0.01	0.28	96.58	18

[a] Abundances are shown as weight per cent. N, number of shards analyzed; NA, not analyzed

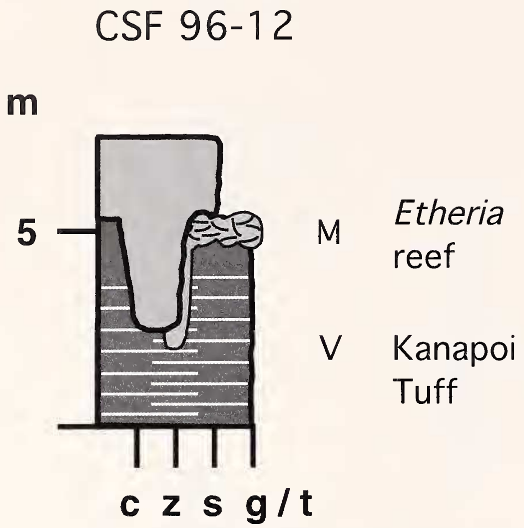

Figure 6 Reference section from the middle portion of the Kanapoi Formation. The Kanapoi Tuff here is deeply channeled, and the channel-fill includes both an *Etheria* bioherm and a later channel sand. See Figure 1 for location of sections. For a key to symbols, see Figure 3

seen at Kanapoi are summarized in Figure 8. This somewhat schematic diagram emphasizes the geometry of the major facies types and their relationships to the underlying basement paleotopography.

FOSSIL CONTEXT AND PALEOENVIRONMENTS

The Kanapoi stratigraphic sequence is summarized in the composite section of Figure 9. This composite forms the basis for a discussion of the context of fossil vertebrate faunas recovered from Kanapoi, as well as for the environmental history recorded in the deposits.

There are two major stratigraphic levels producing the bulk of the vertebrate fossil material at Kanapoi. The lower level is the channel sandstone and overbank mudstone complex associated with the lower and upper pumiceous tephra. Most of the fossils in this interval, including much of the *Australopithecus anamensis* Leakey et al., 1995, hypodigm, come from vertic paleosols developed on the floodplain through this period. The upper fossiliferous zone is the distributary channel complex associated with the Kanapoi Tuff. This richly fossiliferous zone is dominated by aquatic forms (fish and reptiles) but also includes a wide range of terrestrial mammals. Fossils are also found in the upper fluvial sequence, where they are associated with both channel and floodplain settings.

The environmental setting recorded by the Kan-

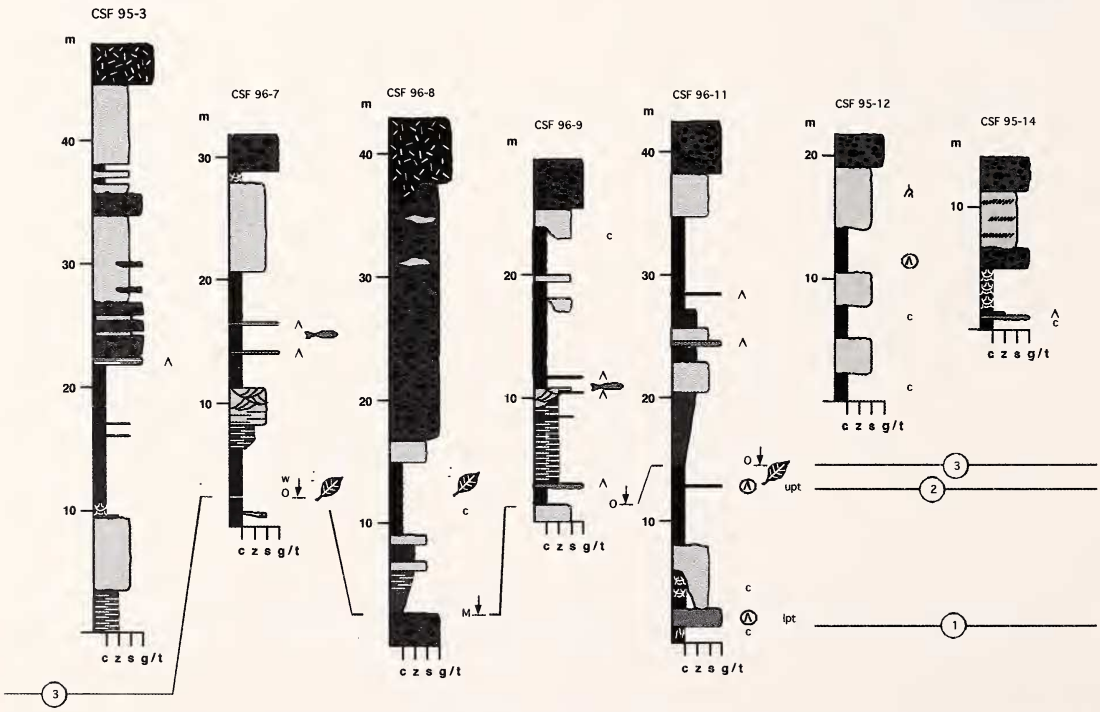

Figure 7 Reference sections from the upper part of the Kanapoi Formation. Numbered correlations shown are 1, lower pumiceous tuff; 2, upper pumiceous tuff; and 3, basal flooding surface of the Lonyumun Lake sequence. See Figure 1 for location of sections. For a key to symbols, see Figure 3

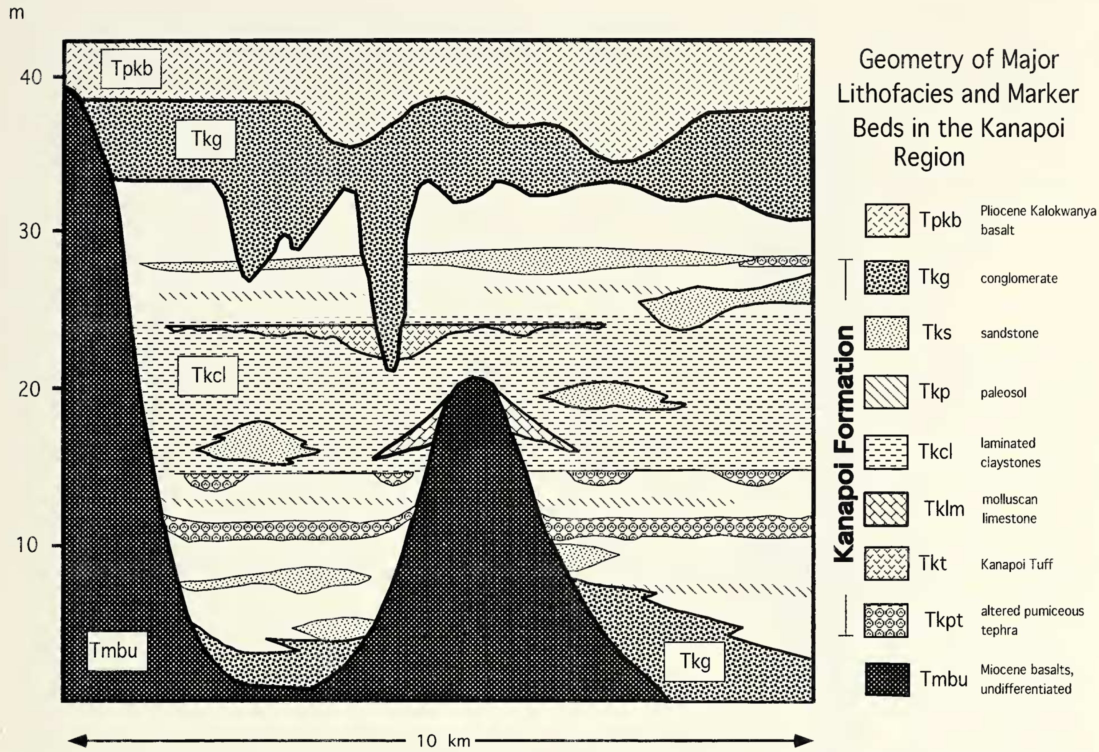

Figure 8 Schematic drawing of the geometry of major lithofacies and marker beds in the Kanapoi Formation. Note the vertical exaggeration in the diagram. Only major components are depicted, minor facies are shown in white

apoi sedimentary sequence reflects a progression of fluvial and lacustrine systems that overwhelmed a volcanic landscape. The fluvial system that dominated local environments throughout the Kanapoi record was the ancestral Kerio River. This is supported by evidence from the tectonic heritage of the region, provenance of sedimentary clasts, and the southerly link provided by correlation of the Kanapoi Tuff into the Baringo Basin. The ancestral Kerio River was certainly seasonal through this time period. Perennial flow is only demonstrated for the middle of the represented time interval, through the presence of *Etheria* reefs in a channel setting above the Kanapoi Tuff. At other times, there are indicators of strong seasonality in flow, particularly in conglomerates low and high in the section as well as in the prevalence of planar cross-stratification in many of the sands. This may reflect strong seasonality in a perennial stream or ephemeral flow conditions. The well-developed upward-fining cycles, particularly in the upper fluvial interval, however, are suggestive of continued perennial flow there.

The hills/islands of the volcanic basement provided a considerable degree of local heterogeneity. For the fluvial systems, this would have been manifest not only in the local topographic relief but also in different soil conditions, drainage, and vegetation patterns. This is an element of habitat patchiness which is not typically seen in the Plio–Pleistocene paleoenvironments investigated from elsewhere in the Turkana Basin (e.g., Feibel et al., 1991). The fluvial systems that encountered this complex landscape were spatially controlled by paleotopographic lows that restricted both the flow patterns for fluvial channels as well as the extent and connectedness of the early floodplains. Although the degree of influence this basement topography exerted decreased through time, it was present throughout the formation.

A strong seasonality in precipitation is documented by the prevalence of vertisols in the overbank deposits. In this sense, the Kanapoi floodplains are closely comparable with those of the early Omo Group sequence (e.g., Moiti, Lokochot, Tulu Bor Members) in the Turkana Basin to the north. There does not appear to be a progressive shift in the character of paleosols through time at Kanapoi. Rather, the variability seen in soil types reflects aspects of the soil catena across the Kanapoi paleolandscape. This relates primarily to topographic effects (including drainage and leaching), soil development on different parent materials, and variations in the maturity of soils induced by reorganizations of the landscape. Examples of the latter are the influence tephra fallouts produced in the lower and upper pumiceous tephra. The pervasive

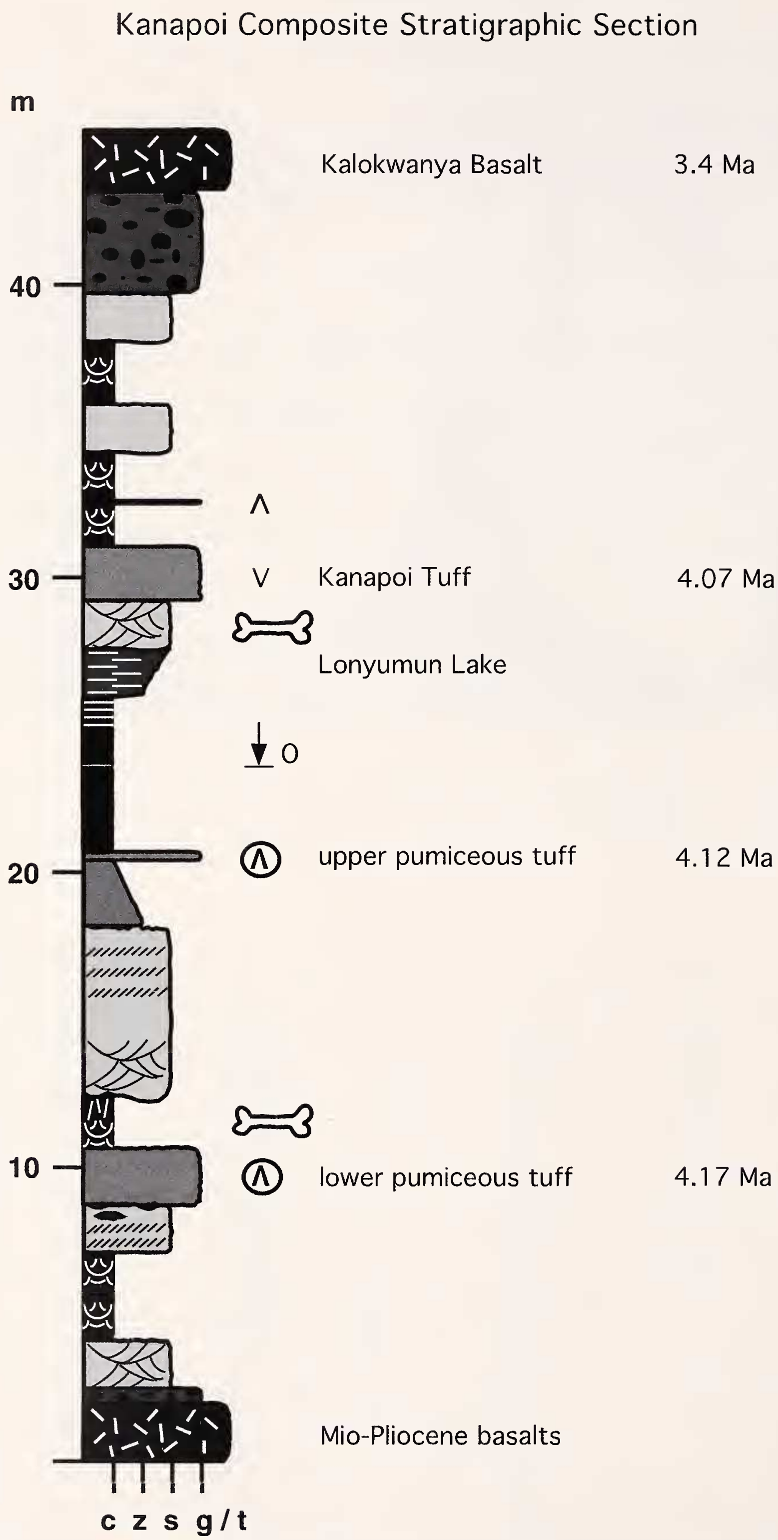

Figure 9 Composite stratigraphic column for the Kanapoi Formation. Note major fossiliferous levels in lower fluvial paleosols and in deltaic sands of the Lonyumun Lake stage. Age control based on work of I. McDougall (Leakey et al., 1995, 1998)

thick profile of the lower pumiceous tephra indicates it blanketed the landscape and would have forced a 'restart' of a successional regime in soil, vegetation, and ecological communities based on this volcanic parent matter. The thinner upper pumiceous tephra is only patchily preserved, which implies that it was locally incorporated into the active soil substrate rather than overwhelming it.

The Lonyumun Lake transgression produced the most dramatic reorganization of the Kanapoi landscape. The sharp basal contact of the lacustrine claystone in this interval demonstrates a rapid drowning of the landscape. The precise chronostratigraphic control on the Kanapoi sequence provides the best age control on this event, which can be placed at 4.10 ± 0.02 Ma. The Lonyumun transgression affected a major portion of the Turkana Basin (ca. 28,000 km^2), most likely due to tectonic or volcanic damming of the basin outlet. The transgression was everywhere rapid, and Kanapoi is situated along the drowned paleovalley into which the ancestral Kerio River flowed.

The rapid local infilling of the Lonyumun Lake at Kanapoi is to be expected from the minimal accommodation space available in this drowned paleovalley and the rapid sedimentation induced by proximity of the ancestral Kerio River Delta. The thick accumulation of the Kanapoi Tuff (nearly 11 m) in the central part of the Kanapoi area resulted from the filling of the interdistributary bays of this delta (Powers 1980) following an explosive eruption in the rift valley to the south. As the lake retreated northwards, a progression of minor inundations and exposure is reflected in the interbedded fluvial and lacustrine strata that mark the transition from the lacustrine phase to the upper fluvial sequence.

The characteristics of the fluvial strata that succeeded the Lonyumun Lake sequence reflect the considerable infilling that the lake phase produced and the broader floodplains available for a meandering river system. In other aspects, however, this river was very similar to the system that existed prior to the Lonyumun transgression. This lower portion of the upper fluvial sequence stands in stark contrast, however, to the upper strata of the interval, where sands and gravels dominate to the near exclusion of mudstones. This upper portion of the formation reflects two fundamental changes in the system, increased supply of coarse clastics and a gradual drop-off in overall accumulation rates. The clastics are dominated by siliceous volcanic cobbles and pebbles, in contrast to the basaltic suite of conglomerates at the base of the formation. This likely reflects renewed tectonic activity in the source area to the south. The slowdown in accumulation is implied rather than measured, as there are no time markers between the Kanapoi Tuff and the Kalokwanya Basalt. The dramatic change in sedimentary facies, however, suggests that much of the time between these two chronostratigraphic markers lies within these upper gravels. This upper portion of the sequence would likely have presented the most dramatic deviation in environmental characteristics. The substrate of the braidplain would have been well drained, and the coarse siliceous volcanics would provide a poor medium for growth of vegetation. The starkness of this landscape would be succeeded, however, by the truly inhospitable volcanic landscape produced by eruption of the Kalokwanya Basalt.

CONCLUSIONS

The Pliocene sedimentary sequence of the Kanapoi region, termed here the Kanapoi Formation, was deposited by the ancestral Kerio River in three phases. Initial deposition occurred upon a fluvial floodplain that was broken by numerous hills of the local Mio–Pliocene basaltic basement. These hills strongly influenced patterns of deposition, as the fluvial system mantled the complex topography with channel gravels and sands, while vertic paleosols developed on the adjacent floodplains. Two pumiceous airfall tephra accumulated on this landscape (lower pumiceous tuff, 4.17 Ma; upper pumiceous tuff, 4.12 Ma), allowing precise chronostratigraphic control on this phase of deposition. The Lonyumun Lake transgression replaced the fluvial system with a lacustrine setting and the rapidly prograding Kerio River Delta. The vitric Kanapoi Tuff (4.07 Ma) was deposited primarily in interdistributary floodbasins at this stage. The progradation locally replaced the Lonyumun Lake with a second floodplain system, somewhat less constrained by basement topography. A shift in this system from a meandering sand/mud fluvial system to a gravel braidplain reflects tectonic activity in the source area to the south and a lowering of accumulation rates. Eruption of the Kalokwanya Basalt effectively ended significant sediment accumulation at Kanapoi.

The rich vertebrate fossil assemblages of Kanapoi are found in floodplain paleosols of the lower and upper fluvial intervals, as well as in the distributary sands of the Kerio River Delta during the Lonyumun Lake phase. The high degree of landscape heterogeneity and pronounced soil catenas of the Kanapoi setting provided some of the greatest habitat patchiness recorded from the Turkana Basin Plio–Pleistocene.

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